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CAUSES OF ACTION FOR EMF HARM

ROY A. TORRES*

Today, it is evident that overhead high voltage transmission lines are a fact of life in a world in which the demands for electric power are constantly growing. Furthermore, it is presently accepted that there is no known way to produce, transmit and distribute electric energy without some effect on the environment. Indeed, it is ironic that, just at the time when a portion of our society has become concerned with the environment and aesthetic questions, this country is saddled with an insatiable appetite which consumes ever increasing amounts of electricity . . .¹

INTRODUCTION

The Zuidema family was much like the average suburban family. They had a beautiful daughter and they had a handsome home overlooking Mission Valley, near San Diego.² When their daughter Mallory turned nine months old, their world collapsed. Mallory was diagnosed as having nephroblastomatosis and later with Wilms Tumor, a rare malignant kidney tumor.³

One day, Mallory's mother, Michele, read an article about electromagnetic fields in *The New Yorker Magazine*, written by Paul Brodeur.⁴ Many of Michele's questions were probably answered that

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1. *Chester Township v. Power Siting Commission of Ohio*, 361 N.E.2d 436, 441 (Ohio 1977) (Lochner, J., dissenting).

2. See generally Philip J. LaVelle, Anne Krueger, *SDG&E Wins Cancer Trial, Jury Finds No Link With Power Lines*, SAN DIEGO UNION-TRIB., May 1, 1993, at A1 [hereinafter LaVelle].

3. Nephroblastomatosis is a rare kidney ailment. See STEDMAN'S MEDICAL DICTIONARY 192 (25th ed. 1990). Wilms' Tumor

is a malignant renal [umor] of young children, composed of small spindle cells and various other types of tissue, including tubules and, in some cases, structures resembling fetal glomeruli, and striated muscle and cartilage; it is radiosensitive, but may have already metastasized to the lungs or elsewhere when a renal mass or hematuria is noted.

Id. at 1654. Many of the existing residential epidemiological studies on EMF harm focus on leukemia or brain cancer. E. Gregory Barnes, *A Blitz Fails*, 131 PUB. UTIL. FORT. 10 (July 1, 1993).

4. Paul Brodeur is a staff writer at the NEW YORKER, and has written nine books on environmental harms. LaVelle, *supra* note 2. See Dirk Mathison, *Feeling Fatigued? The Power Line Next Door May Be the Source*, 32 PEOPLE WEEKLY 137 (Nov. 27, 1989).

day, yet many more questions about her daughter's affliction arose. Consequently, Michele met Paul Brodeur at a lecture at a local shopping center.⁵ It was then that the Zuidemas learned of the dangers that the 12kV⁶ distribution lines running along their property presented, not to mention the risks posed by the 230kV, 69kV and 38kV transmission lines running along their backyard or the step-down transformer carrying 230,000 volts of current, standing only twelve feet from the Zuidema's roof.⁷ Soon thereafter, the Zuidema family vacated their nightmarish home in order to save their child, taking a loss of \$50,000 on their one-time dream.⁸

This scene is no longer an uncommon phenomenon. As more information is disseminated concerning the harms caused by electromagnetic fields, people are beginning to look at their homes in a different light. Did they purchase a death trap that threatens their family? Or could they be overreacting to another false alarm by environmentalists? And even if there is an adverse effect on health, how does one measure that effect and how does one isolate a specific source among so many possible sources? Unfortunately, there is still no clear cut answer to many of these questions, nor does one seem to be appearing in the near future.

A. What are Electromagnetic Fields?

In order to properly appreciate the problems involving EMF⁹ exposure, a basic understanding of electromagnetic fields is necessary. "Electric fields are produced when electric current flows through an electrical conductor such as a power line,"¹⁰ and results from the interaction of electricity and magnetic fields.¹¹ We therefore encounter electromagnetic fields virtually wherever we go throughout a building. In addition, every electrical appliance gives off an electromagnetic field.¹²

5. LaVelle, *supra* note 2.

6. kV is the abbreviation for kilovolt.

7. Michael Granberry, *Power Lines Did Not Cause Child's Rare Cancer, Jury Finds*, L.A. TIMES, May 1, 1993, at A-24.

8. LaVelle, *supra* note 2.

9. EMF is the acronym for electromagnetic fields. This article will utilize both "electromagnetic fields" and its acronym — EMF. "The term 'electromagnetic field' encompass[es] both electric and magnetic fields generated by a wide variety of sources, and operating at many different frequencies." Sherry Young, *Regulatory and Judicial Responses to the Possibility of Biological Hazards from Electromagnetic Fields Generated by Power Lines*, 36 VILL. L. REV. 129, 135 n.13 (1991).

10. Reba Goodman et al., *Electromagnetic Fields and Cells*, 51 J. CELL. BIOCHEM. 436 (April 1993).

11. John Weiss, Note, *The Power Line Controversy: Legal Responses to Potential Electromagnetic Field Health Hazards*, 15 COLUM. J. ENVTL. L. 359, 360 (1990) (citing *Electromagnetic Field*, 6 M-H ENC. SCI. TECH. 146 (1986)).

12. *Id.* Unlike many other sources of health problems, EMFs come from hundreds of thousands of sources in varying degrees of strength. Thus, the problem of EMFs cannot be easily abated.

EMFs are not, however, a product of modern society. EMFs exist in nature as well.¹³ The earth has its own natural electromagnetic field,¹⁴ as do living organisms.¹⁵ Certain organisms have even developed the ability to detect EMFs.¹⁶

An EMF is a measurable entity, and varies with current flow¹⁷ EMFs are measured in volts (or kilovolts) per meter, or V/m (or kV/m).¹⁸ The following excerpt explains briefly how the current flow and the power line system work:

The power distribution process begins when electric generators in power stations produce electric power at approximately 20 kilovolts (kv). "Step-up" transformers increase this voltage to approximately 765 kv for transfer over high voltage transmission lines. These transmission lines terminate at substations where "step-down" transformers decrease the voltage for transfer through local distribution lines to individual users.¹⁹

While this vast network provides electricity to millions, it also provides an ample amount of exposure to many. One of the peculiar characteristics of EMFs is that they can penetrate buildings²⁰ as well as the human body.²¹ People are bombarded with EMFs, both from sources within their homes, as well as from sources outside their homes. A sixty = hertz magnetic field is created within a home as a result of an imbalance caused by the levels of current flowing in electrical wires.²² The supply current should match the return current, however, some of the return current tends to flow through the ground

13. U.S. Congress, Office of Technology Assessment, *Biological Effects of Power Frequency Electric and Magnetic Fields — Background Paper*, 67 OTA-BP-E-53 at 1 (May 1989) [hereinafter *OTA Paper*].

14. *Id.*

15. *Id.*

16. *Id.* Sharks use this gift for feeding and for navigation.

17. Young, *supra* note 9, at 135.

18. Weiss, *supra* note 11, at 363.

19. Young, *supra* note 9, at 135. Power transmission and distribution systems in the United States use 60 = hertz alternating current (hertz are the international unit of frequency, which is abbreviated as "hz"). It is called alternating current, because the current will alternate back and forth at a certain rate each second, so that 60 hz means that the current will alternate 60 times every second.

20. Although certain large objects may provide shielding from EMFs, houses and trees provide no shielding. Only those objects containing iron will provide shielding to a significant degree. *OTA Paper*, *supra* note 13, at 8.

21. Nancy Wertheimer & Ed Leeper, *Electrical Wiring Configurations and Childhood Cancer*, 109 AM. J. EPID. 273 (1979). This study represents the first major study of the effect of EMFs on children. When published, it was widely criticized for lacking accuracy, yet it paved the way for a number of other studies and for the first time it introduced the public to the harm that power lines may cause. E.P.A., AIR AND WASTE MANAGEMENT DIVISION, REGION II, N.Y., *Status Report of the Research in Electromagnetic Fields* (Jan. 17, 1992).

22. Wertheimer & Leeper, *supra* note 21, at 273-74.

and through the plumbing system.²³ Therefore, whether or not a person is near an electrical appliance, one may be exposed continuously to EMFs.²⁴

B. Sources of Electromagnetic Fields

Modern technology has created hazards never experienced in the past. Electrical power is but one of many of the features of modern society and there are a vast number of sources of EMFs causing potential harm. The two most common sources among the possible sources of EMFs are household appliances and electric power lines.²⁵ A particular concern to people — especially to pregnant women — are electric blankets. This concern is raised, not only because of the creation of an EMF, but also because of the proximity and duration of exposure.²⁶ Electric blankets will give off an EMF ranging from 100 V/m to 1,000 V/m, which is similar to the EMF level near the edge of a high voltage transmission line.²⁷

Even household appliances produce very strong EMFs. Standing near a typical home appliance can expose you to a similar (or possibly higher) EMF level to that occurring at the right of way of a high voltage transmission line.²⁸ Here too, proximity and exposure are two important variables.²⁹ However, while appliances generally produce an intense EMF, the field nevertheless drops off quite quickly with distance.³⁰

I. POSSIBLE THEORIES OF RECOVERY

This section will discuss various theories of recovery which may be raised in electromagnetic field litigation. As scientific evidence has grown, so too has litigation. And while the scientific evidence has not

23. *Id.* Most electrical systems in homes are grounded to the plumbing system, thereby increasing the size of the electromagnetic field. *Id.* at 274.

24. Although this level may appear very low, it is in fact orders of magnitude larger than that found in nature. *Id.*

25. Kristopher D. Brown, *Electromagnetic Field Injury Claims: Judicial Reaction To An Emerging Public-Health Issue*, 72 B.U. L. REV. 325, 329 (1992).

26. Invariably, when an electric blanket is used it is laid over a person for hours at a time. Although little is known of what effect these two variables may have, it would be wise to reduce these two factors wherever possible. This is particularly true for women who are pregnant, since there may be harm to the unborn child.

27. Weiss, *supra* note 11, at 362.

28. *Id.* at 362-63.

29. A third variable in the degree of harm is the current flow in the appliance. An increase in the setting of the appliance will create a stronger EMF, due to the higher current flow. Brown, *supra* note 25, at 660 n.31.

30. *Id.* See also Robert Pool, *Is There an EMF-Cancer Connection?*, 249 SCI. 1096, 1097 (1990). EMFs produced by appliances will drop off to nothing within a distance of one to seven meters, yet at close proximity, they are far more intense than the EMF produced by 500kV transmission lines and distribution lines. However, distribution line EMFs will not terminate until a distance of 50 to 1000 meters. Transmission line EMFs terminate at a distance of 500 to 3000 meters. *Id.*

yet gained satisfactory credibility, its impact has been felt particularly in eminent domain cases and in cases in which neighborhoods and/or communities have sought to stop the construction of power lines.³¹

A. Trespass

One of the more commonly raised claims in EMF cases is trespass.³² Although this cause of action has not met with great success,³³ trespass claims are pursued aggressively because they carry the potential for substantial awards, due in part to liberal recovery theories.³⁴

There are several elements to this cause of action. First, the plaintiff must show entry.³⁵ This requirement was once limited to visible objects.³⁶ However, the law has now evolved — in recognition of scientific advancement — extending liability so that any invasion of another's property by microscopic particles may be considered a trespass.³⁷ It is not a far stretch to broaden this principle to electromagnetic fields. In the seminal case *Martin v. Reynolds Co.*, the court specifically defined trespass "as any intrusion that invades the possessor's protected interest in exclusive possession, whether that intrusion is visible or invisible pieces of matter or by energy . . ."³⁸

The second element that a plaintiff must prove is intent.³⁹ The Restatement (Second) of Torts states that an intentional trespass occurs when one intentionally enters or causes a thing or another person to enter the land of another, or remains on the land, or fails to remove

31. For a lengthy discussion of how the Not in My Backyard (NIMBY) concept has affected power line construction, see Young, *supra* note 9.

32. A trespass is an invasion of the property owner's interest in his exclusive possession of property. W. PAGE KEETON ET AL., PROSSER AND KEETON ON THE LAW OF TORTS § 622 (5th ed. 1984) [hereinafter PROSSER AND KEETON].

33. Philip S. McCune, *The Power Line Health Controversy: Legal Problems and Proposals for Reform*, 24 U. MICH. J.L. REF. 429, 449 (1991).

34. *Id.* Punitive damages are usually available where the trespasser has acted with intent. See, e.g., *Zimmer v. Stephenson*, 403 P.2d 343 (Wash. 1965).

35. PROSSER AND KEETON, *supra* note 32, § 622.

36. *Martin v. Reynolds Metals Co.*, 342 P.2d 790 (Or. 1959), *cert. denied*, 362 U.S. 918 (1960). The court in this decision abandoned the previous rule requiring a party seeking to prove trespass to show a visible object or thing.

It is quite possible that in an earlier day when science had not yet peered into the molecular and atomic world of small particles, the courts could not fit an invasion through unseen physical instrumentalities into the requirement that a trespass can result only from a *direct* invasion. In fact, the now famous equation $E=mc^2$ has taught us that mass and energy are equivalents and that our concept of "things" must be reframed. [T]hese observations on science become very practical and real to the possessor of land when the unseen force cracks the foundation of his house.

Id. at 793. The rule announced in *Martin* continues to be the law in Oregon. See *Ream v. Keen*, 838 P.2d 1073 (Or. 1992).

37. *Martin*, 342 P.2d at 794.

38. *Id.*

39. This article will only deal with intentional trespass onto land. Negligent trespass will not be discussed.

an object from the land where one owes that duty to the owner of the land, whether one causes harm or not.⁴⁰ The requirement of intent is interpreted very broadly and can easily be satisfied. One need only prove that the "actor, without himself entering the land, may [have] invade[d] another's interest in his exclusive possession by throwing, propelling, or placing a thing either on or beneath the surface of the land or in the air space above it."⁴¹ Following these principles, the court in *Bradley v. American Smelting & Refining Co.*,⁴² recognized that the defendant had, with knowledge, released sulfur dioxide, arsenic, cadmium and other metals from its smokestacks for decades.⁴³ An example of how this reasoning might apply in a power line suit is where a utility knows, or has reason to know, that the EMF emitted from its lines ranged 400 feet outward on either side while its right of way extended for only 200 feet. If people's homes were affected within the EMF range, then the utility's knowledge of the potential harm would be sufficient to establish intent.⁴⁴

1. Defenses to Trespass: Consent

One defense that power companies may assert is consent.⁴⁵ Consent is critical because it may be an absolute defense to trespass, if given by the owner or by a person authorized to grant consent.⁴⁶ Notions of equity are very important in these cases. If the homeowner has recently purchased a home alongside transmission lines, his purchase price will undoubtedly reflect the lower marketability of the home.⁴⁷ In this situation, implied consent may be manifested by the purchaser's actions, silence, or even inaction.⁴⁸ It would be unreasonable and inequitable under these circumstances to provide the plaintiff who has "come to the nuisance" with a windfall. Second, notice to this

40. RESTATEMENT (SECOND) OF TORTS § 158 (1977) [hereinafter RESTATEMENT].

41. *Id.* § 158 cmt. 1, cl. (a). Intent focuses on what the actor wishes to occur from his deed or what he believes his actions will be substantially certain to produce. *Id.* § 8A.

42. 709 P.2d 782 (Wash. 1985) [hereinafter *ASARCO*].

43. *Id.* at 784. Tall smokestacks were a common method of dispersing pollutants over wide areas so that the emissions would be driven by wind and rise into the atmosphere. This would result in minute levels of microscopic particles flowing through the air throughout a vast area of land. Stack heights are regulated under the Clean Air Act, 42 U.S.C. §§ 7401-7461 (1988).

44. *ASARCO*, 709 P.2d at 785-86. See generally, Young, *supra* note 9; Weiss, *supra* note 11. Since studies have been available for some time, a prudent utility should seek to condemn affected property and to extend its right of way as a precautionary matter.

45. The burden of proving consent usually falls on the defendant. PROSSER AND KEETON, *supra* note 32, § 18. See also *Salisbury Livestock Co. v. Colorado Cent. Credit Union*, 793 P.2d 470, 475 (Wyo. 1990).

46. *Belluomo v. Kake TV & Radio, Inc.*, 596 P.2d 832 (Kan. Ct. App. 1979).

47. Brown, *supra* note 25, at 655-56.

48. Where an individual would have learned of a fact by exercising ordinary care, he may be deemed to have had constructive knowledge of that fact. *Attoe v. State Farm Mut. Auto. Ins. Co.*, 153 N.W.2d 575, 579 (Wis. 1967).

purchaser may not be required; he is in a far different situation than the innocent purchaser who finds out that a utility plans to run transmission lines through his backyard. The result would be different if the plaintiff had moved his home prior to the time when scientific information became available and media speculation had begun.

Consent is also a problem for the homeowner who willingly sells a portion of his property to the utility knowing that the utility is planning to construct transmission towers or run high voltage power lines through the land. However, the result would be different where the property owner resists the utility's purchase or condemnation. Like the previous hypothetical, the time frame in which the consent occurred is critical. If within the last decade or two, it would not be unreasonable to expect the ordinary person to have some idea that high voltage lines present a potential for harm.⁴⁹ The utility may also claim consent by virtue of mistake.⁵⁰ This claim would be of limited use, however, for even if the utility could overcome its burden, if the property owner removes his consent, the utility must terminate its operation or it will be found to be trespassing.⁵¹

2. Remedies

If the plaintiff is ultimately successful, what remedies can he obtain? Nominal damages are awarded where the plaintiff suffers no harm.⁵² If the homeowner does have injuries and the court holds that a trespass did in fact occur, all proximate damages to the land become the responsibility of the trespasser.⁵³ Liability will also include other proximate harms, such as "injury to the person of the possessor, her chattels, and even her family"⁵⁴ Therefore, claims for injuries of

49. It is difficult to imagine a person disregarding a serious threat to his health. However, there are still quite a number of people who dismiss the power line threat to take advantage of a low purchase price. Should the law provide a remedy to these people? When scientific evidence on potential EMF hazards was first surfacing, an opportunistic purchaser should have been held responsible for lack of knowledge of the potential hazards. Today, however, at the very least, the purchaser has not acted prudently. At worst, he has acted with callous disregard for his safety against all reason, and should therefore not expect the law to reward him. See RESTATEMENT, *supra* note 40, § 840D.

50. *Id.* § 892B. If the conduct of one person or his words may be reasonably understood by another as forming consent, then those actions or words will be recognized as providing consent.

51. *Id.* § 160.

52. *Id.* If the damages are trifling, the law will nevertheless recognize a technical trespass and will provide an award.

53. PROSSER AND KEETON, *supra* note 32, § 13.

54. McCune, *supra* note 33, at 452 n.132 (citing PROSSER AND KEETON, *supra* note 32, § 13). See also *Wardrop v. City of Manhattan Beach*, 326 P.2d 15, 24 (Cal. Ct. App. 1958) (jury award for a child who contracted polio after contaminated water was pumped into plaintiff's backyard).

mental distress suffered by the homeowner and/or his family are recoverable, as would be any injury to his person.⁵⁵

3. Continuing Trespass

The continuing nature of the trespass may create another hurdle for the plaintiff. Certain courts have allowed a plaintiff to bring successive actions to seek recovery for damages,⁵⁶ while other courts will either require defendants committing a continuing trespass to remedy the condition or will issue an injunction.⁵⁷ However, most courts treat an EMF power line as a permanent nuisance⁵⁸ and will not issue an abatement order or an injunction.⁵⁹ What does this mean to the EMF plaintiff? He will either be permitted only a single recovery for prospective damages, or he will have to bring a suit under inverse condemnation.⁶⁰ A trespass cause of action can be profitable for a plaintiff to pursue, although it is difficult to bring in the power line context. Insofar as proving harm to one's person, a plaintiff will still face the problem of causation.⁶¹

B. Nuisance

A second cause of action that an aggrieved party may bring is grounded in nuisance law, based on the substantial interference caused by the EMFs.⁶² In this case, a plaintiff must proffer evidence

55. PROSSER AND KEETON, *supra* note 32, § 13.

56. McCune, *supra* note 33, at 453 (citing Riblet v. Ideal Cement Co., 345 P.2d 173, 175-76 (Wash. 1959); PROSSER AND KEETON, *supra* note 32, § 13).

57. *Id.* (citing Berin v. Olson, 439 A.2d 357, 360-61 (Conn. 1981)).

58. RESTATEMENT, *supra* note 40, § 158 cmt. m. A permanent trespass is where a series of acts (of the same nature) are continued, so that in the aggregate, they make up one indivisible wrong. BLACK'S LAW DICTIONARY 1503 (6th ed. 1990). *See also* 3 WILLIAM BLACKSTONE, COMMENTARIES *212.

59. McCune, *supra* note 33, at 453-54. Structures which are the result of eminent domain are not generally amenable to abatement or injunction. *Id.* at 453. *See also* PROSSER AND KEETON, *supra* note 32, § 13 n.60; Beetschen v. Shell Pipe Line Corp., 253 S.W.2d 785, 788 (Mo. 1952); Evans v. City of Johnstown, 410 N.Y.S.2d 199, 200-01 (Sup. Ct. 1978).

60. McCune, *supra* note 33, at 453.

61. Even if the plaintiff were in a jurisdiction where abatement or injunction were available, it would be unrealistic to expect a court to impose such an onerous order upon a utility and an affected community, except in the most extreme situation. In Houston Lighting & Power Co. v. Klein Indep. Sch. Dist., 739 S.W.2d 508 (Tex. Ct. App. 1987) the court found a trespass by a utility after it voided the utility's condemnation of a parcel of the school district's property. The court also granted an injunction stopping the utility from operating its power lines. *Id.* This case may represent one of the few circumstances where an injunction may be justified, since the utility had not placed the transmission lines into operation. However, this case was overturned on appeal.

62. A nuisance is where one person's unreasonable actions or conduct interferes with another property owner's use and quiet enjoyment of his land. RESTATEMENT, *supra* note 40, § 821A, *see also* PROSSER AND KEETON, *supra* note 32, § 87. Many courts confuse nuisance with trespass because the two are similar. Bradley, 709 P.2d at 787; *see also* Borland v. Sanders Lead Co., 369 So. 2d 523, 527-29 (Ala. 1979).

that the alleged nuisance is unreasonable and substantial, that is to say, that the plaintiff has suffered more than a trivial harm.⁶³ Mere inconvenience is not actionable.⁶⁴ “[t]hus the casting of a candle beam upon the screen of a drive-in theater would not constitute an actionable invasion, simply because the intrusion is so trifling that the law will not consider it and the principle *de minimis non curat lex* is applicable.”⁶⁵ However, plaintiffs alleging nuisance can easily show a substantial harm due to the decline in property values caused from EMF fears.⁶⁶

1. Public Nuisance

Many of the possible EMF power line cases may be considered public nuisances. Since harm or property devaluation resulting from an EMF will affect a large group of people who live adjacent to the power lines, it may be seen as a harm common to many.⁶⁷ The doctrine of public nuisance seeks to protect the public right — a right common to the community, such as the right of access to a public park or to fish in that park’s lake.⁶⁸ Since the public nuisance theory is premised on this “public right,” it is usually a government official who brings the action, such as a district attorney, an attorney general, or a municipal attorney.⁶⁹ While this avenue is available to a homeowner, it is probably to his benefit if he can demonstrate some particular harm separate and apart from the remainder of the community, or one that is qualitatively different from the harm to the community. One example of unique harm is where the property owner’s home sits inside the electromagnetic field and his family has been harmed to a substantial degree, while other neighbors’ homes merely abut the power line’s EMF and thus suffer less harm.⁷⁰

2. Private Nuisance

A person affected as described above may seek to bring a claim of private nuisance. A party claiming individual injuries where a public

63. PROSSER AND KEETON, *supra* note 32, § 88.

64. *Id.*

65. *Martin*, 342 P.2d at 794.

66. EMF effects on property values will be discussed later in this article.

67. Prosser defines a public nuisance in two ways: (1) as “an act or omission which obstructs or causes inconvenience or damage to the public in the exercise of rights common to all Her Majesty’s subjects”; and (2) as “the doing of or failure to do something that injuriously affects the safety, health or morals of the public, or works some substantial annoyance, inconvenience or injury to the public.” PROSSER AND KEETON, *supra* note 32, § 90, at 643 & n.2.

68. RESTATEMENT, *supra* note 40, § 821B, cmt. g.

69. PROSSER AND KEETON, *supra* note 32, §§ 88-90.

70. RESTATEMENT, *supra* note 40, § 821C(1). Another particularized harm would be where the owner’s home has suffered a severe drop in property values, as opposed to the minimal loss suffered by others.

nuisance has been alleged may still merit a trial for a private nuisance cause of action.⁷¹

An important element in a nuisance cause of action is the defendant's conduct. The moving party must show that either the defendant's conduct was: (1) abnormally dangerous; (2) negligent; or (3) intentional and unreasonable.⁷² An EMF plaintiff would likely have to prove either intent or negligence, because courts have, to date, been unwilling to recognize power line EMFs as abnormally dangerous.⁷³ Negligence can be proven in some jurisdictions. For example, in *Houston Lighting & Power Co.*, the power company was found to have acted with reckless disregard for community safety when it constructed transmission lines in close proximity to a school. The defendant's action, it was determined, created the potential danger of EMFs radiating onto school property.⁷⁴

A plaintiff should include intentional and unreasonable conduct and not merely negligent conduct as part of his claim, so that the court will have an alternative if it does not agree with the plaintiff on one cause of action. As previously mentioned, the *Bradley* case makes it quite easy for a plaintiff to prove intentional conduct.⁷⁵ Here, however, a plaintiff must also prove that the intentional conduct was unreasonable.⁷⁶ This takes place when "the harm caused by the conduct is serious and the financial burden of compensating for this and for similar harm to others would not make the continuation of the conduct [un]feasible."⁷⁷ Certainly, with the millions of miles of high voltage lines running throughout the nation, if scientific evidence progresses to the stage where EMF harm can be credible and admissible, utilities will face an enormous liability. Yet it would not render industry operations unfeasible, as certain measures can be taken to reduce exposure, such as using underground lines and widening rights of way. Therefore, if a plaintiff can prove that his harm from power line EMFs was substantial, a utility should not be able to hide behind the social importance of providing electricity to the public; there are ways that a utility can mitigate harm.

3. Remedies

The remedies available to a plaintiff in a nuisance suit are less substantial than those available in a trespass action. The main benefit of

71. *Brown v. County Comm'rs of Scioto County*, 1993 WL 367587 (Ohio App. 1993).

72. RESTATEMENT, *supra* note 40, § 822; *see also* *Hall v. Phillips*, 436 N.W.2d 139, 141-42 (Neb. 1989).

73. *McCune*, *supra* note 33, at 455.

74. *Houston Lighting & Power Co.*, 739 S.W.2d at 518-20.

75. *ASARCO*, 709 P.2d at 785-86.

76. RESTATEMENT, *supra* note 40, § 822.

77. *Id.* § 826(b).

a nuisance action is the opportunity to obtain an injunction.⁷⁸ However, injunctions in power line cases are of very limited use, as the plaintiff must prove that the harm outweighs the usefulness of the utility's conduct.⁷⁹ The possibility of a court awarding an injunction is extremely slim because electric power's usefulness drastically outweighs the harm to a plaintiff, such that a court is more likely to find a permanent nuisance and then award permanent damages.⁸⁰ Therefore, a nuisance theory may not be useful for a plaintiff unless it is combined with other causes of action, except in the rare case where the power lines have not yet gone into operation.

C. *Strict Liability*

1. *Products Liability*

A third theory of liability under which a plaintiff may seek relief is strict products liability. However, courts are unlikely to favor a plaintiff's claim under this theory.⁸¹ The Restatement (Second) of Torts section 402A sets forth what type of seller can be held liable under this cause of action:

(1) one who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if

(a) the seller is engaged in the business of selling such a product and

(b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.⁸²

If a plaintiff is unable to prove any element, the claim fails.⁸³ A utility would be liable to the ultimate user or consumer if the electricity was in a defective and unreasonably dangerous condition and it

78. See *supra* notes 57-58 and accompanying text.

79. McCune, *supra* note 33, at 457. "Courts thus balance the equities when deciding whether to issue an injunction." *Id.* See also PROSSER AND KEETON, *supra* note 32, § 88A.

80. See *supra* notes 56-58; see also *Boomer v. Atlantic Cement Co.*, 257 N.E.2d 870, 873 (N.Y. 1970).

81. Brown, *supra* note 25, at 335-36. This is despite the fact that some courts have recognized that electric power transmitted into a home is a product and not a service. *Pierce v. Pacific Gas & Elec. Co.*, 212 Cal. Rptr. 283, 292 (Cal. Ct. App. 1985); see also *Ransome v. Wisconsin Elec. Power Co.*, 275 N.W.2d 641, 646 (Wis. 1979); Cf. *Houston Lighting & Power Co. v. Reynolds*, 712 S.W.2d 761, 766 (Tex. Ct. App. 1986) (recognizing that although providing electricity is a service, it does not follow that electricity is not a product under a strict products liability analysis).

82. RESTATEMENT, *supra* note 40, § 402A.

83. *Smithbower v. Southwest Cent. Rural Elec. Coop., Inc.*, 542 A.2d 140, 143 (Pa. Super. Ct. 1988). A number of states have recognized the doctrine of strict products liability as set forth in the Restatement. See *Webb v. Zern*, 220 A.2d 853 (Pa. 1966); *Toner v. Lederle Labs.*, 732 P.2d 297 (Idaho 1987); *Public Serv. Ind., Inc. v. Nichols*, 494 N.E.2d 349 (Ind. Ct. App. 1986).

reached the consumer without substantial change in its condition.⁸⁴ In order for strict products liability to be found, the electricity must have passed the power lines and reached the user.⁸⁵

Most states recognize electricity as a service and not a product.⁸⁶ However, a few states such as Colorado, have found that electricity is a product if it has passed through the customer's electric meter.⁸⁷ Courts finding that electricity is a product reason that it has been placed in the stream of commerce and that it is no longer in the control of the utility.⁸⁸ However, the courts using the "stream of commerce" theory have also recognized strong policy justifications for their conclusion.⁸⁹ The problem with public policy is that it often cuts either way. Policy considerations such as "social utility" can be used in favor of utilities.⁹⁰ There is no argument about the social utility and sheer necessity of electric energy.⁹¹ Therefore, only in an unusual case, with a very restricted factual pattern, will a plaintiff have a reasonable chance of success.⁹² There are various grounds for a court to provide a remedy to an aggrieved plaintiff.⁹³ A utility's liability may

84. RESTATEMENT, *supra* note 40, § 402A. See generally *Voss v. Black & Decker Mfg.*, 450 N.E.2d 204 (N.Y. 1983); *Codling v. Paglia*, 298 N.E.2d 622 (N.Y. 1973).

85. New York, and other states have declined to find electricity a product for purposes of strict products liability where the electricity has not left power or transmission lines. *Bowen v. Niagara Mohawk Power Corp.*, 590 N.Y.S.2d 628, 631 (N.Y. App. Div. 1992); see also *Smith v. Home Light & Power Co.*, 734 P.2d 1051 (Colo. 1987); *Genaust v. Illinois Power Co.*, 343 N.E.2d 465, 469-70 (Ill. 1976); *Public Serv. Ind. Inc. v. Nichols*, 494 N.E.2d 349 (Ind. Ct. App. 1986).

86. *Bowen*, 590 N.Y.S.2d at 631.

87. *Smith*, 734 P.2d at 1055.

88. *E.g.*, *Ransome v. Wisconsin Elec. Power Co.*, 275 N.W.2d 641, 643 (Wis. 1979).

89. The Wisconsin Supreme Court noted that public policy considerations weighed heavily in its decision. It determined that utilities were in a much better position "to anticipate, protect against, and eliminate possible dangerous electricity overloads" and could "more easily absorb or spread or insure against any financial losses which result." *Id.* at 650. California courts have also followed this reasoning. *Pierce v. Pacific Gas & Elec. Co.*, 212 Cal. Rptr. 283 (Cal. Ct. App. 1985).

90. In one products liability case, an Illinois court noted that absolute liability cannot be imposed on utilities, not only because social and economic burdens would be overwhelming, but also on the principle that utilities are not absolute insurers of the public safety. *Fliszar v. Commonwealth Edison Co.*, 527 N.E.2d 1016, 1019 (Ill. App. Ct. 1988).

91. A utility "may be held liable for EMF related damages if, regardless of fault, either (1) the risk EMF poses to people outweighs the social utility of a particular EMF source or use, or (2) the value of an EMF source or use outweighs the risk to people (making EMF unavoidably dangerous), but EMF generators or manufacturers failed to warn of EMF dangers." *Brown*, *supra* note 25, at 336.

92. *Id.*

93. Courts have established a number of justifications for holding manufacturers strictly liable without inquiring into the culpability of their conduct. These include [*sic*] (1) manufacturers are in the best position to reduce risk of harm; (2) a loss may be overwhelming to an individual, yet effectively insured by a manufacturer and distributed among the public as a cost; (3) manufacturers should be responsible for products they put on the market; (4) negligence approaches strict liability, *de facto*; (5) prevention of breach of warranty throughout the chain of distribution promotes efficiency; (6) the

stem from its "failure to (1) investigate potential risks associated with EMF, (2) redesign sources of EMF, (3) remove sources of EMF from the marketplace or human environment, and (4) provide warnings about EMF."⁹⁴ Strict products liability (which can be brought against manufacturers, generators, or sellers of electricity) centers on the source of harm.⁹⁵

Apart from the product/service debate over electricity, the greatest difficulty for a plaintiff asserting a strict product liability claim is that scientific evidence simply does not provide legal causation. Thus, it would be unlikely that a court would even find it necessary to engage in a balancing of the alleged harm and the social utility of electricity. Until such time that scientific evidence establishes that EMFs cause physical harm in a manner that will satisfy the requirements of legal causation, the most that the public can expect is warning labels on products. Even this meager remedy may be impossible to achieve.⁹⁶

2. Abnormally Dangerous Activity

An EMF plaintiff may assert another cause of action which is based on an ultrahazardous or abnormally dangerous activity.⁹⁷ The aggrieved party can bring this action either as a private nuisance⁹⁸ or as an independent tort.⁹⁹ This cause of action provides a remedy for harm to a person, land, or chattel resulting from the abnormally dangerous activity.¹⁰⁰ The Restatement provides a number of factors that are to be considered in this analysis:

- (a) existence of a high degree of risk of some harm to the person, land or chattels of others;
- (b) likelihood that the harm that results from it will be great;
- (c) inability to eliminate the risk by exercise of reasonable care;
- (d) extent to which the activity is not a matter of common usage;

consumer is not in a position to investigate safety, even though advertisements and trademarks lull consumers' vigilance; and (7) the buyer assumes a product will safely do the job it was built to do and has no reason to suspect a defect beneath the surface.

Id. at 335-36 n.63 (citing *Greenman v. Yuba Power Prods.*, 377 P.2d 897, 901-02 (Cal. 1963); *Escola v. Coca Cola Bottling Co.*, 150 P.2d 436, 440-41 (Cal. 1944)).

94. *Brown*, *supra* note 25, at 335.

95. *See id.* at 336.

96. A Food and Drug Advisory Committee at the F.D.A. refused to recommend mandatory warning labels on video display terminals and electric blankets, although it encouraged manufacturers to lower EMF levels from their products. *Id.* at 336 n.65.

97. The First Restatement used the old label "ultrahazardous activity." *RESTATEMENT*, *supra* note 40, §§ 519-520. Ultrahazardous activity had its genesis in the seminal case *Rylands v. Fletcher*, 1 L.R. Exch. 265 (1866). That case involved the flooding of a coal mine from a reservoir that had burst. The decision, finding liability, was premised on "nonnatural use" (non-ordinary use) of the defendant's land. *Id.*

98. *See supra* notes 72-73 and accompanying text.

99. *RESTATEMENT*, *supra* note 40, § 519.

100. *Id.* § 519(1).

- (e) inappropriateness of the activity to the place where it is carried on; and
- (f) extent to which its value to the community is outweighed by its dangerous attributes.¹⁰¹

Relying on existing scientific evidence, plaintiffs would be unable to prove any EMF harm to people, let alone the element of great harm that is contained within part (b) above. Providing electric power is an activity that is of common usage virtually anywhere. Further, the value of providing electric power is of overwhelming benefit to the community. Additionally, endeavors carried on in pursuance of a public duty are rarely held strictly liable in an abnormally dangerous activities nuisance claim.¹⁰² Plaintiffs would face insurmountable odds in proving a case based on abnormally dangerous activity, as no court has recognized power lines as abnormally dangerous per se.¹⁰³

D. *Inverse Condemnation & Eminent Domain*

Inverse condemnation suits are the most commonly brought suits and the most successful suits against utilities for EMF-related claims.¹⁰⁴ Property claims are far more numerous than personal injury claims, and are still on the rise.¹⁰⁵ Inverse condemnation "cases usually concern severance damages, that is, compensation for the diminished value of property remaining after a partial condemnation of one's land."¹⁰⁶ Eminent domain is the state power to take private property for public use either temporarily or permanently.¹⁰⁷ When a government entity seeks to exercise its power of eminent domain, it

101. *Id.* § 520.

102. "The transmission of electricity is a public necessity." *Kentucky Utils. Co. v. Auto Crane Co.*, 674 S.W.2d 15, 18 (Ky. 1983); see also RESTATEMENT, *supra* note 40, § 521.

103. McCune, *supra* note 33, at 455; see also *Kentucky Utils.*, 674 S.W.2d at 18.

104. "Inverse-condemnation and eminent-domain proceedings are the established methods for property owners to recover monetary damages for the impact of power-line EMFs on neighboring property." McCune, *supra* note 33, at 433.

105. *Id.*

106. Weiss, *supra* note 11, at 365. See also BLACK'S LAW DICTIONARY 825 (6th ed. 1990) (defining inverse condemnation as "a remedy peculiar to the property owner and is exercisable by him where it appears that the taker of the property does not intend to bring eminent domain proceedings").

107. WILLIAM B. STOEBOCK, NONTRESPASSORY TAKINGS IN EMINENT DOMAIN 4 (1977). Limitation on the government's eminent domain power is set forth in the Fifth Amendment to the United States Constitution which requires a state to pay "just compensation" for a taking. U.S. CONST. amend. V The Fourteenth Amendment applies the just compensation requirement to the states. U.S. CONST. amend. XIV See generally *Penn Central Transp. Co. v. City of New York*, 438 U.S. 104 (1978); *Fred F French Investing Co. v. City of New York*, 350 N.E.2d 381 (N.Y. 1976), appeal dismissed, 429 U.S. 990 (1977); *First English Evangelical Lutheran Church of Glendale v. County of Los Angeles*, 482 U.S. 304 (1987); *Lucas v. South Carolina Coastal Council*, 112 S. Ct. 2886 (1992).

does so through a condemnation proceeding.¹⁰⁸ This proceeding is to determine the price for the property taken and for consequential damages to the remaining property due to diminished value.¹⁰⁹

There are three distinct views on how to recompense a party in an inverse condemnation suit. The three views may thus be summarized as follows:

[F]ear of danger from power lines is necessarily based on pure speculation by an ignorant public and can never be an element of damages even if it affects the market value of the land. The second holds that, while conjectural damages are noncompensable, if the fear is shown to be reasonable (or at least not wholly unreasonable) and in fact affects [the] market value, the loss is compensable. The third holds that the dangerous nature of power lines is a fact proven by common experience, and that the impact of public fear of such danger on market value may be shown and compensated without independent proof of the reasonableness of that fear.¹¹⁰

The jurisdictions following the third and most liberal (majority) view are: Arkansas, California, Florida, Indiana, Iowa, Louisiana, New York, North Carolina, Ohio, Oklahoma, South Dakota, Virginia, and Washington, and the Court of Appeals for the 6th Circuit (where many suits are filed against the Tennessee Valley Authority).¹¹¹ States following the second or intermediate view are Connecticut, Georgia, Kansas, Kentucky, Missouri, Nebraska, New Jersey, Tennessee, Texas, and Utah.¹¹² Following the minority view (which is the strictest) are Alabama, Illinois, and West Virginia.¹¹³

1. Majority View

The leading case representing the majority view is *San Diego Gas & Electric Co. v. Daley*.¹¹⁴ This case arose from an appeal by SDG&E of a condemnation award to a landowner. SDG&E sought to condemn property in order to build overhead transmission lines. The jury awarded the property owner \$190,000 for the condemned property

108. Stoebeck, *supra* note 107, at 5-6. However, the state may also buy the property outright if there is a meeting of the minds on the price to be paid for the property in question.

109. *Id.* at 1-3.

110. *Willsey v. Kansas City Power & Light Co.*, 631 P.2d 268, 273-74 (Kan. Ct. App. 1981).

111. Weiss, *supra* note 11, at 366. Recently joining the liberal approach, the New York Court of Appeals noted that "[w]hether the danger [of power line health risk] is a scientifically genuine or verifiable fact should be irrelevant to the central issue of its market value impact." See *Criscuola v. Power Auth. of State of New York*, 621 N.E.2d 1195, 1196 (N.Y. 1993).

112. *Id.*

113. *Id.*

114. 253 Cal. Rptr. 144 (Cal. Ct. App. 1988).

and \$1,035,000 for the diminished value to the remaining property.¹¹⁵ During the trial, the property owner, Lawrence Daley, presented a number of witnesses to establish his case. A civil engineer, Robert Walters, testified about how power lines caused several problems, such as electromagnetic emanations.¹¹⁶ Joseph G. Johns, an environmental planner, then testified as to the static noise that was given off by the power lines, and Robert W. Williams, a real estate appraiser, gave testimony concerning the effect on the land's value on the market.¹¹⁷

On appeal, SDG&E objected to the testimony of all of the plaintiff's experts, but the court denied the defendant's objections, stating that severance damages "can be based on any indirect factors that cause a decline in the market value of the property."¹¹⁸ The plaintiff "should be compensated for any characteristic of the project which causes an adverse impact on the fair market value of the remainder."¹¹⁹ The court noted that the experts properly testified on the effects that power lines would have on the market value of the property outside of the easement.¹²⁰ Finally, the court of appeals recognized that the trial court was correct in its opinion, that the issue before the court was not whether or not EMFs cause health hazards, but whether the fear of the danger from the power lines affected the property's market value.¹²¹

2. Intermediate View

The leading case illustrating the second, or intermediate view, is *Zappavigna v State of New York*.¹²² By judgment of the court of claims, Zappavigna was awarded \$53,352 for direct damages and \$41,215 for consequential damages arising from the partial taking of

115. *Id.* at 145. Daley was also awarded \$486,066.68 in interest and in litigation expenses.

116. *Id.* at 147. Walters testified that on a previous project involving 500,000 volt transmission lines, he included a setback of 1,000 feet in his plans. He went on to state that since becoming aware of EMF dangers, he intended to call the hazard to the attention of future developers.

117. *Id.* at 148.

118. *Id.* at 150.

119. *Id.*

120. *Id.* at 151 (quoting *South Bay Irr. Dist. v. California Am. Water Co.*, 133 Cal. Rptr. 166 (Cal. Ct. App. 1976)) (finding that "any evidence which may be fairly considered as shedding light on the market value of the property will be admitted," as long as it is not clearly speculative or guess work).

121. *Id.* at 152. In a recent Florida decision, *Florida Power & Light Co. v. Jennings*, 518 So. 2d 895, 897 (Fla. 1987), the court held that "all evidence relevant to the issue of full compensation is admissible in eminent domain proceedings. The public's 'fear' as a factor which may be relevant to the issue of just compensation may be utilized as a basis for an expert's valuation opinion regardless of whether or not this fear is objectively reasonable."

122. 588 N.Y.S.2d 585 (N.Y. App. Div. 1992). *Zappavigna* was recently overturned by the New York Court of Appeals in the *Criscuola* decision. See *supra* note 111.

his property.¹²³ During the trial, the claimant asserted that the remaining property was diminished in its value due to "cancerphobia" (a fear by the public of contracting cancer from EMFs) and offered expert testimony to support his assertion.¹²⁴ The court of claims rejected Zappavigna's claims and held that the claimant would need to prove, by a preponderance of the available scientific evidence, that a potential buyer had a reasonable ground for fear of EMFs and that the fear affected the market value of the property in question.¹²⁵ The court of claims further held that it could not compensate the claimant for his allegation based on EMFs, as the claimant did not carry his burden of proof.¹²⁶ The New York Supreme Court noted that damages for a consequential loss must be based on the opinion of an experienced, knowledgeable expert or on actual market data showing a reduction in the value of the remaining property, but that the record below had insufficient evidence to support an award of consequential damages.¹²⁷

123. *Id.* at 586. The State of New York, acting pursuant to its power of eminent domain on behalf of the New York State Power Authority, obtained a 250 foot wide strip of land running 3100 feet long on the plaintiff's property.

124. *Id.*

125. See *Zappavigna v. State & Power Auth. of New York*, No. 74085, slip op. at 12, 30-31 (N.Y. Ct. Cl. Sept. 29, 1989). McCune suggests that the court's approach may be violative of the U.S. Constitution.

The *Zappavigna* test would allow a court to find that EMF fears do affect property values adversely (under the second prong of the test) and yet deny damages if the plaintiff does not prove the reasonableness of this fear by a preponderance of the credible scientific evidence (under the first prong of the test). Just compensation should be based solely on the loss in market value that is caused by the taking at issue. [F]ear of EMFs that adversely affects property values must be accounted for to provide just compensation, regardless of the reasonableness of that fear. Thus, the first prong should be irrelevant. By admitting that EMF fears can decrease market value and yet denying compensation to a plaintiff for that loss of value if those fears are unreasonable, the *Zappavigna* test opens itself up to constitutional attack.

McCune, *supra* note 33 at 437-38.

126. The court noted that it could not provide an award based solely on fear. *Zappavigna*, No. 74085, slip op. at 30-31. As noted earlier, the New York Court of Appeals has overturned the Appellate Division's approach by its decision in *Criscuola*, noting that "[t]o add the extra component of reasonableness because the condition may not be something within common knowledge or experience is not supportable or necessary. Thus the public's or the market's relatively more prevalent perception should suffice, scientific certitude or reasonableness notwithstanding." *Criscuola*, 621 N.E.2d at 1197.

127. "The court's determination of the value of the property after the appropriation appears to have been based solely upon its subjective opinion . . . [and thus] there is no basis in the record for the trial court's award of consequential damages." *Zappavigna*, 588 N.Y.S.2d at 588. This court requires an inordinately high level of proof. A plaintiff, at the very least, would have to obtain actual sales data from the real estate market.

Another case following the intermediate rule is *Willsey v Kansas City Power & Light*,¹²⁸ which set forth a test to determine reasonableness of EMF fears. The *Willsey* court used a three-part test originally employed by the Texas Civil Appellate Court in *Heddin v Delhi Gas Pipeline Co.*¹²⁹ to determine if a fear is reasonable. The court stated that

[f]ear in the minds of the buying public on the date of taking is relevant to the proof of damages when the following elements appear: 1. That there is a basis in reason or experience for the fear; 2. That such fear enters into the calculations of persons who deal in the buying and selling of similar property; and 3. Depreciation of market value because of the existence of such fear . . .¹³⁰

Applying this test, the court in *Willsey* came to the opposite result of *Zappavigna*. It found that the fear of power lines was "eminently reasonable," and thus admitted the evidence as a consideration.¹³¹

3. Minority View

The minority view, which is followed by only three jurisdictions, can be illustrated by *Alabama Power Co. v. Keystone Lume Co.*¹³² The court succinctly stated that there is no right to compensation for the diminished market value from alleged fears of a potential buyer from EMF exposure from power lines.¹³³

The minority approach can be attributed to the lack of any scientific evidence of EMF harm when such cases were decided. Since it is only recently that studies have shown a possible health hazard, it is very likely that the states following the strict view will inevitably discard this archaic view. Only the majority view provides a logical analysis for inverse condemnation cases. Whether the fears of buyers are reasonable or not does not negate the very real reduction in market value caused by the proximity of the property to the high voltage power lines. Property owners injured in this substantial manner should receive some measure of compensation for their loss.

E. Personal Injury

Cases involving personal injury from power line electromagnetic fields are extremely sparse. Two reasons contribute to this fact: (1) the lack of scientific evidence establishing legal causation;¹³⁴ and (2)

128. 631 P.2d 268 (Kan. Ct. App. 1981). This case was an appeal by the utility from a condemnation proceeding.

129. 522 S.W.2d 886 (Tex. 1975).

130. *Id.* at 888.

131. *Willsey*, 631 P.2d at 279.

132. 67 So. 833 (Ala. 1914).

133. *Id.* at 835-37.

134. The issue of causation will be discussed later in this article.

the expense of litigating an EMF case.¹³⁵ This problem is exacerbated by the fact that the utility can call on virtually unlimited resources in its defense.¹³⁶ Other procedural difficulties include the statute of limitations¹³⁷ and stipulations sealing records in previously settled cases.¹³⁸

In 1987, the first personal injury suit in the EMF area was brought against the Houston Lighting & Power Company.¹³⁹ The plaintiff, Michael Allen Scott, claimed that his brain tumor was either caused, or worsened, by an EMF emitted from a 345kV transmission line located near his home.¹⁴⁰ The plaintiff's complaint relied upon negligence and strict liability theories.¹⁴¹ Scott claimed the utility should be held strictly liable for any ensuing injuries since "the use of power lines presented an unreasonably dangerous activity."¹⁴² Scott also claimed that the utility knew of the dangers caused by electromagnetic field emission from high voltage power lines, yet failed to warn its customers, including himself.¹⁴³

"Unfortunately for purposes of this analysis, the suit was dropped in 1990 following the plaintiff's death."¹⁴⁴ Because of sealed records and the number of cases dropped by plaintiffs, little case law has developed in this area. Therefore, for the reasons mentioned above, this cause of action will not be fruitful unless and until scientific evidence becomes more precise and establishes a causal link.¹⁴⁵

F. Damages

1. Cancerphobia

Certain damages that are peculiar to toxic tort claims are very relevant to electromagnetic field claims. Cancerphobia, or the inordinate fear of acquiring cancer from high voltage power lines, may someday prove to be a compensable damage that an EMF plaintiff might pur-

135. Weiss, *supra* note 11, at 363-64.

136. Utilities can merely absorb the costs of litigation into their rate base. *Id.*

137. *Id.*

138. Weiss notes that many microwave suits are settled with sealed records, thus it is very difficult to make any comparisons to EMF cases. *Id.*

139. Brown, *supra* note 25, at 332; Plaintiff's Petition, Scott v. Houston Lighting & Power Co. (No. 87-58967), (189th Jud. Dist., Harris County, Tex. 1987), noted in Weiss, *supra* note 11, at 364 n.30.

140. Weiss, *supra* note 11, at 364-65.

141. *Id.* at 365.

142. Brown, *supra* note 25, at 332.

143. Weiss, *supra* note 11, at 365.

144. Brown, *supra* note 25, at 332 n.46. Another case litigated in this area asserted a claim of failure to warn by the Mississippi Power Company for health risks from EMFs emitted from high voltage power lines. Central to the case, was a brochure disseminated in the early 1980s, which stated that there was "no harm whatsoever" to human health, from power lines. However, the settlement in this case was not made public. *Id.* at 332 n.49.

145. See *infra* note 179.

sue.¹⁴⁶ Currently, no jurisdiction provides compensation for a property owner's fear of acquiring cancer from power lines.¹⁴⁷ Nor does any jurisdiction provide compensation for "the possibility that the power line will harm persons or property in the future."¹⁴⁸

Yet there are many plaintiffs who are exposed to harmful substances who seek compensation for emotional distress from the fear of acquiring a disease such as cancer.¹⁴⁹ A number of those plaintiffs have even been awarded damages for their emotional and mental distress for perceived elevated risk.¹⁵⁰ At first blush (since no EMF case has been successful), EMF-based emotional distress claims may seem to be less compelling, but in reality this is merely a case of science lacking clear evidence of harm from EMFs. Once (if ever) scientific evidence provides a causal link of physical harm from EMF exposure, recovery may be possible. Thus, one's emotional distress of acquiring cancer from exposure to power line EMFs, is currently nothing more than non-compensable damages.

2. Increased Risk of Harm

Another theory of damages that a plaintiff may pursue is a claim based on the increased or enhanced risk of developing serious infirmity, caused by exposure to a toxic tort. This theory is distinct from a claim for medical monitoring.¹⁵¹ For a plaintiff to be successful on such a claim, he must set forth with "reasonable certainty" that the future harm will occur.¹⁵² In a recent New Jersey decision, an appellate court noted that New Jersey courts have invariably refused to recognize a claim for enhanced risk of harm where no harm has occurred and where the "plaintiff cannot quantify or otherwise show the likelihood of future harm as a matter of probability."¹⁵³ To establish a

146. Damages for such things as distress and discomfort represent "distinct grounds of compensation for which in ordinary cases the person in possession is allowed to recover in addition to the harm to his proprietary interests." RESTATEMENT, *supra* note 40, § 929 cmt. e.

147. Young, *supra* note 10, at 162.

148. *Id.* In *Werlein v. United States*, 746 F. Supp. 887, 905 (D. Minn. 1990), the court noted that in order for a plaintiff to be successful on a claim of negligent infliction of emotional distress, a plaintiff must: "1) suffer a contemporaneous physical injury; or 2) have been in some personal physical danger caused by the defendant's negligence and manifest physical symptoms of the distress; or 3) have been subject to an underlying tort involving a direct invasion of the plaintiff's rights, such as defamation or malicious prosecution."

149. Brown, *supra* note 26, at 334.

150. *Id.*

151. *Hansen v. Mountain Fuel Supply Co.*, 858 P.2d 970, 976 (Utah 1993).

152. *Stites v. Sundstrand Heat Transfer, Inc.*, 660 F. Supp. 1516, 1524 (W.D. Mich. 1987).

153. *Karol v. Berkow*, 603 A.2d 547, 551 (N.J. Super. A.D. 1992). Cf. *Jackson v. Johns-Manville Sales Corp.*, 781 F.2d 394, 413 (5th Cir. 1986) (recovery only where the plaintiff can show that "the toxic exposure more probably than not will lead to cancer").

"reasonable certainty," the plaintiff's experts must set forth with sufficient specificity the enhanced risk of harm.¹⁵⁴

Again, an EMF plaintiff will have great difficulty proving these damages. Such a plaintiff will have to overcome some challenging hurdles including the failure of scientific evidence to demonstrate legal causation and the judicial reluctance to accept this theory of damages.¹⁵⁵

3. Medical Monitoring

Medical monitoring is another theory of damages relevant in EMF cases. This theory is based on the long latency periods common to diseases resulting from contact to various toxic substances and the enhanced risk of contracting such diseases as cancer. In theory, to reduce the seriousness of future disease, the plaintiff should obtain pre-symptom recovery to cover expenses for periodic tests to track any developing disease and to provide him with preventive care.¹⁵⁶ The prevailing rule was announced in *Wilson v. Johns-Manville Corp.*¹⁵⁷ The *Wilson* court noted that the

traditional American rule . . . is that recovery of damages based on future consequences may be had only if such consequences are "reasonably certain." Recovery for damages for speculative or conjectural consequences is not permitted. To meet the "reasonably certain" standard, courts have generally required plaintiffs to prove that it is more likely than not (a greater than 50% chance) that the projected consequence will occur. If such proof is made, the alleged future effect may be treated as certain to happen and the injured party may be awarded full compensation for it; if the proof does not establish a greater than 50% chance, the injured party's award must be limited to damages for harm already manifest.¹⁵⁸

Under this rule, a plaintiff bringing suit based on EMF exposure will have difficulty proving his case. Plaintiffs bringing suits for medi-

154. *Stites*, 660 F Supp. at 1524-25.

155. *Mountain Fuel Supply Co.*, 858 P.2d at 976. See generally Kristen Chapin, Comment, *Toxic Torts, Public Health Data, and the Evolving Common Law: Compensation for Increased Risk of Future Injury*, 13 J. ENERGY NAT. RESOURCES & ENVTL. L. 129 (1993).

156. *Ayers v. Township of Jackson*, 525 A.2d 287, 298-99 (N.J. 1987).

157. 684 F.2d 111 (D.C. Cir. 1982). "Assuming that a given plaintiff can prove that he has present injuries that increases his risk of future harm, medically appropriate monitoring is simply a future medical cost, which is certainly recoverable. There is ample authority for the proposition that upon proper proof, injured plaintiffs may recover damages for medical monitoring." *Werlein*, 746 F Supp. at 904 (citations omitted).

158. *Wilson*, 684 F.2d at 119; see RESTATEMENT, *supra* note 40, § 910, cmt. a. "Recently there has been some discussion of, and support for, a 'simple probability' or 'pro rata' approach. Such an approach would allow a percentage recovery equal to the injured party's chance of incurring the future harm." *Wilson*, 684 F.2d at 119.

cal monitoring for exposure to toxic torts have had little success.¹⁵⁹ Although a plaintiff may believe he has a reasonable chance of success under an EMF claim because of the low burden (50% chance that consequences will occur), he will nevertheless confront another hurdle. In cases where a claim for medical monitoring has been successful, there has always been a showing of a present physical harm. In *Werlein v. United States*,¹⁶⁰ the court, in denying a dismissal, noted that the plaintiff's experts testified that actual physical injury from exposure to trichloroethylene had occurred.¹⁶¹ Thus, an EMF plaintiff, to survive a motion to dismiss, may need to introduce expert testimony that the plaintiff has suffered some actual present injury. A claim that there is only a mere possibility of future harm from EMFs, may prove to be insufficient.¹⁶² Such a plaintiff may see his case dismissed at the outset of the trial.

II. ESTABLISHING CAUSATION AFTER DAUBERT

A. *Daubert's Effect on Scientific Evidence*

Plaintiffs pursuing claims for damages caused by electromagnetic field exposure have had to contend with the "*Frye* Rule."¹⁶³ The Rule had its genesis in a case involving the introduction of evidence from a recently developed device, the polygraph machine. The Court of Appeals for the District of Columbia stated that:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized. . . . [T]he thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.¹⁶⁴

159. See *Stites v. Sundstrand Heat Transfer, Inc.*, 660 F. Supp. 1516 (W.D. Mich. 1987) (granting summary judgment to the defendant, where plaintiff alleged exposure to trichloroethylene); *Amendola v. Kansas City S. Ry. Co.*, 699 F. Supp. 1401 (W.D. Mo. 1988) (claim for enhanced risk from asbestos exposure denied).

160. 746 F. Supp. 887 (D. Minn. 1990).

161. *Id.* at 904-05.

162. Another obstacle for the EMF plaintiff is the lack of recognition that the courts have had for scientific data on EMF harm. In *Werlein*, the defendant contended that the court "should dismiss the common law medical monitoring claim because plaintiffs ha[d] no legally sufficient proof that the toxic substances they ingested [were] capable of harming humans. This argument [was unavailing] in light of the court's prior ruling regarding the exposed as well as the factual issues involved." 746 F. Supp. at 905. Following the same logic, a defendant's motion to dismiss a medical monitoring claim for possible EMF harm will very likely be successful, since no court has yet to find EMFs harmful.

163. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). The *Frye* Rule, setting out the admissibility standard by which scientific evidence is accepted in federal courts, has been the law of the land for roughly 70 years. The *Frye* Rule states that expert testimony based on a scientific technique is inadmissible unless the technique is "generally accepted" as reliable in the relevant scientific community. 293 F. at 1014.

164. *Id.*

In *Frye*, the court found that the evidence had not yet gained "general acceptance" in the scientific community.¹⁶⁵ Since 1923, the *Frye* Rule has been the "gatekeeper" by which studies on EMFs have been kept from being admitted. This is because the rule is the "exclusive test for admitting expert scientific testimony."¹⁶⁶

In *Daubert v. Merrell Dow Pharmaceutical, Inc.*, the Supreme Court was faced squarely with the issue of whether or not the Federal Rules of Evidence¹⁶⁷ superseded *Frye's* "general acceptance" rule. The Court noted that there was a specific section in the Federal Rules of Evidence that spoke to the admissibility of scientific evidence.¹⁶⁸ Rule 702 states that:

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.¹⁶⁹

The Court noted that "[n]othing in the text of this Rule establishes 'general acceptance' as an absolute prerequisite to admissibility . . . [and that] a rigid 'general acceptance' requirement would be at odds with the 'liberal thrust' of the Federal Rules and their 'general approach of relaxing the traditional barriers to opinion testimony.'"¹⁷⁰ Therefore, the Court held that the *Frye* Rule was superseded by the Federal Rules of Evidence.¹⁷¹ Justice Blackmun noted that the trial judge has a gatekeeping responsibility in that he must "ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable."¹⁷²

The trial judge will thus examine a number of factors when presented with scientific evidence and/or testimony.¹⁷³ One key consideration will be whether the scientific technique has been tested.¹⁷⁴ "Another pertinent consideration is whether the theory or technique

165. *Id.*

166. *Daubert v. Merrell Dow Pharmaceutical, Inc.*, 113 S. Ct. 2786, 2792 (1993).

167. Fed. R. Evid. 702.

168. *Daubert*, 113 S. Ct. at 2794.

169. Fed. R. Evid. 702. The *Daubert* Court also noted that Rule 402 provides the baseline for the introduction of evidence, stating the liberal language of the Rules that "all relevant evidence is admissible, except as otherwise provided" 113 S. Ct. at 2794 (quoting *United States v. Abel*, 469 U.S. 45, 51-52 (1984)).

170. *Id.* The *Frye* Rule had dealt exclusively with "novel scientific approaches, while Rule 702 does not have that limited application." *Id.* at 2796 n.11.

171. *Id.* at 2794 n.6.

172. *Id.* at 2796. "[T]he trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue." *Id.*

173. "Many factors will bear on the inquiry, and we do not presume to set out a definitive checklist or test." *Id.*

174. "Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry." Michael Green, *Expert Witnesses and*

has been subjected to peer review and publication. Publication (which is but one element of peer review) is not a *sine qua non* of admissibility.¹⁷⁵ A further factor to consider will be whether the technique has acquired widespread acceptance within the scientific community.¹⁷⁶

In the view of a number of people, discarding the *Frye* Rule might permit the introduction of "junk science" into evidence.¹⁷⁷ One attorney, Alan Raul, stated that the "court's decision may make it easier to get 'junk science' in front of a jury"¹⁷⁸ Others have had mixed reviews:

Bob Charrow, attorney for the Chemical Manufacturers Association, said that the Supreme Court's decision will have both positive and negative effects on the chemical industry. "The good news is that seven justices recognized the importance of valid science [in court]," he said, "They focused the criteria for valid science and gave judges the ability to screen junk science out. The bad news is that the Court was not clear in setting the rules." Charrow pointed out that the lower courts previously used these more relaxed standards to admit scientific evidence.¹⁷⁹

Still others have lauded the decision. Plaintiff's attorney Barry Nace called the case a "total victory," stating that "what the court is saying is you put together the right kind of experts, and you've got a fact question for the jury."¹⁸⁰ Hope Babcock, a professor of environmental law at Georgetown University and former general counsel at the National Audubon Society, noted that plaintiffs will be allowed to bring new testimony before juries.¹⁸¹ This would have a significant impact on "personal injury claims from environmental contaminants such as pesticides, asbestos, second-hand smoke or electromagnetic fields . . ."¹⁸²

Undoubtedly, the gates for the introduction of scientific evidence have been opened wide, but this does necessarily mean that "junk sci-

Sufficiency of Evidence in Toxic Substances Litigation: The Legacy of Agent Orange and Bendectin Litigation, 86 NW. U. L. REV. 643, 645 (1992).

175. *Daubert*, 113 S. Ct. at 2797. "[S]ubmission to the scrutiny of the scientific community is a component of good science, in part because it increases the likelihood that substantive flaws in methodology will be detected." *Id.*

176. *Id.*

177. *Id.* at 2798. "Respondent expresses apprehension that the abandonment of 'general acceptance' as the exclusive requirement for admission will result in 'free-for-all' in which befuddled juries are confounded by absurd and irrational pseudoscientific assertions." *Id.*

178. Mr. Raul is an attorney with Beveridge & Diamond in Washington, D.C., and a former general counsel to the U.S. Department of Agriculture. Dan Kramin & Dale Curtis, *Supreme Court: Ruling a Boon For Science or "Junk"?*, GREENWIRE, August 3, 1993.

179. "General Acceptance" Theory of Evidence No Longer Good Law, *Supreme Court Rules*, 17 Chem. Reg. Rep. (BNA) 703 (July 2, 1993).

180. *Id.*

181. Kramin, *supra* note 178.

182. *Id.*

ence" will flood the courtrooms, as trial judges can maintain a tight reign on what may get through the "gate."¹⁸³ The Supreme Court specified that safeguards against the introduction of "junk science" remained intact.¹⁸⁴ "Vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."¹⁸⁵

B. Causation & Exposure

Prior to *Daubert*, many courts looked askance at scientific testimony on EMF-related harms.¹⁸⁶ The Florida Supreme Court has called such testimony nothing more than "dire scientific predictions."¹⁸⁷ Unlike other toxic torts that have been the subject of intense scientific study for decades, EMF research is still in its infancy.¹⁸⁸ Even though the EMF research is in its genesis, the main matter of concern for EMF plaintiffs is establishing causation.¹⁸⁹

"Proving causation presents the most difficulty for the EMF plaintiff."¹⁹⁰ As the moving party, the EMF plaintiff will have the burden of proving causation between exposure and the alleged injury.¹⁹¹ The plaintiff will be confronted with a number of complications:

Three major difficulties arise in proving causation in the EMF context. First, the available scientific evidence on biological effects of EMF remains inconclusive. To satisfy proof of causation requirements, the plaintiff, in effect must prove what science has not yet been able to show. Even if scientists are able to link EMF exposure

183. The first significant test of how *Daubert* will affect EMF litigation may shortly appear as three EMF-related cases are pending and each month, new EMF-related cases are filed in courts across the country. Roy W. Krieger, *On the Line*, 80 A.B.A. J. 40, 45 (Jan. 1994) (citing *In re Robert Pilisuk*, No. 92-2051 (Seattle case involving cancer allegedly sustained from EMFs); *Jordon v. Georgia Power*, No. 91-4103 (cancer from EMF exposure); *Bullock v. Northeast Utils.*, No. CV-92-3266976 (brain cancer allegedly caused by powerline substation)).

184. *Daubert*, 113 S. Ct. at 2796.

185. *Id.* at 2798.

186. Brown, *supra* note 26, at 339.

187. *Florida Power & Light Co. v. Jennings*, 518 So. 2d 895, 899 (Fla. 1987).

188. *Public Serv. Co. v. Linnebur*, 687 P.2d 506, 507-08 (Colo. Ct. App. 1984), *aff'd*, 716 P.2d 1120 (Colo. 1986). See *supra* notes 20-24 and accompanying text. The first major EMF study was the Wertheimer & Leeper report. The earliest research conducted came from the Soviet Union in 1972. *OTA Paper*, *supra* note 13, at 1.

189. "Two obstacles facing virtually every EMF plaintiff are (1) proving the causal connection between exposure to EMF and the injury for which recovery is sought, and (2) determining the role of scientific uncertainty and expert witnesses in establishing an EMF health risk." Brown, *supra* note 25, at 337.

190. *Id.* at 337. "Given the difficulties of proving causation in EMF cases, plaintiffs will likely rely on sophisticated risk assessments as evidence to prove EMF causation." *Id.* at 337 n.69. Cf. Gary E. Marchant & Michael S. Baram, *The Use of Risk Assessment Evidence to Prove Increased Risk and Alternative Causation in Toxic Tort Litigation*, 41 FED'N INS. & CORP. COUNS. 95, 96 (1990).

191. Brown, *supra* note 25, at 338.

to cancer, it may not follow that everyone exposed to EMF will develop cancer. Second, injury may not occur until long after exposure. Third, perhaps most problematic to EMF victims, is that the diseases that result from exposure to EMF may also result from exposure to other environmental harms.¹⁹²

Reliability in expert testimony in this area is very difficult to acquire, as the "scientific community has yet to produce even one study showing a causal link between EMFs and cancer."¹⁹³ Studies in this area are in their infancy, yet many scientists are beginning to realize that EMFs may cause some biological effects on humans.¹⁹⁴ Although there has not been a direct link established, studies have shown that EMFs may act as cancer promoters.¹⁹⁵

Again, the biggest difficulty for plaintiffs is trying to isolate subjects in the studies from other possible sources of electromagnetic field exposure.¹⁹⁶ Adding to the many obstacles encountered by EMF plaintiffs is that the studies conducted "have . . . conflicting results for each group of victims and type of exposure studied."¹⁹⁷ Where does this leave a plaintiff? As the accuracy of scientific research is enhanced, ruling out background causes of cancer, a plaintiff will find more and more evidence admissible in court and personal injury claims easier to bring. Unlike the *Frye* Rule, the relaxed liberal standard of the Federal Rules of Evidence may allow more scientific evidence into courtrooms.

CONCLUSION

Electromagnetic field litigation will undoubtedly expand with time. Scientific studies will also expand, but it will probably be a number of years before any study will provide sufficient reliability and acceptance by the courts. A potential plaintiff may bring multiple causes of action to obtain redress for harms incurred from EMFs. However, claims brought in the real property field are the most successful.

192. *Id.* There is also an added problem when distinguishing the source of injury. Many toxins, such as lead, have limited sources such as drinking water, paint, or leaded fuel. Yet EMFs have almost an infinite number of sources. See *supra* notes 25-30 and accompanying text. Therefore, the plaintiff is faced with an enormous problem in apportioning liability.

193. Todd Brown, Comment, *The Power Line Plaintiff & the Inverse Condemnation Alternative*, 19 B.C. ENVTL. AFF. L. REV. 655, 666 (1992).

194. *OTA Paper*, *supra* note 13, at 2.

195. *Id.* at 24-28; "Whenever a cell's growth ability is affected, the likelihood of cancer promotion may be increased [as EMF] exposed cancer cells [have been shown to] proliferate more rapidly than [in] unexposed cancer cells." Brown, *supra* note 25, at 662 n.51. See *OTA Paper*, *supra* note 14. Numerous studies have been conducted which support a link between EMFs and cancer promotion. Young, *supra* note 9, at 138-39 nn.31-35.

196. Levels of exposure are another quantity that is almost impossible to measure. Young, *supra* note 9, at 148.

197. *Id.*

Not until the scientific community can isolate specific EMF sources and study their particular effects on humans will there be much hope for plaintiffs who have suffered possible personal injuries from EMF exposure. Certainly, much more study and research needs to be conducted by the scientific community. With the Supreme Court's decision in *Daubert*, a plaintiff may at least survive an outright dismissal of his personal injury cause of action. *Daubert's* reliance on the liberal application of the Federal Rules of Evidence and the end of the dominance of the *Frye* Rule presents significant hope for future plaintiffs.

As for utilities, they should look to extend their rights of way so that fewer homes are affected by EMFs emitted by their high voltage lines. As costly as it may be, they should also consider placing such lines underground to minimize EMF exposure to the public. Manufacturers should seek to redesign their electrical products to reduce the EMF levels. Reasonable precaution demands nothing less. Both manufacturers and utilities should seek to reduce their potential for liability for EMF harm. Otherwise, courts in the future may find a degree of culpability based on their knowledge of EMF harm. Of course, the other possibility is that electromagnetic fields pose no harm, and utilities might find that they spent millions of dollars in litigation, underground power line construction, or condemnation proceedings over a false alarm.

